NESTING OF PURPLE MARTINS ABOARD A SHIP[1]

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In 1961, a pair of Purple Martins (*Progne subis*) succeeded in nesting in a gourd attached to the mast of the University of Georgia Marine Institute's research ship, the *Kit Jones*, despite the vessel's frequent cruises that lasted from one to nine hours. When the vessel was absent from the dock, the parents did not accompany the boat, but returned to the nest as soon as the vessel returned. Since this incident demonstrates remarkable ability of both eggs and young to survive long periods of inattendance by the parents, the history of the nest is recorded in detail in this paper.

The martin gourd was fastened to the mast of the *Kit Jones* in April 1961, by Mr. Ralph Olson, retired captain of the vessel. Several gourds were also placed on light poles and boat davits at the nearby dock. Martins nested in the dock gourds early in May, and by early June a pair occupied the gourd on the *Kit Jones.*

The young from two of the gourds on the dock were banded with U.S. Fish and Wildlife Service bands in mid-June (four on 14 June and three on 16 June). On 17 July, three nestlings in the gourd on the mast were banded. Judging from the extent of feather development, the nestlings were estimated to be about 20 days old. The approximate dates of egg laying (9–12 June), start of incubation (12 June), and hatching (27 June) were then estimated according to the data of Allen and Nice (1952).

Unfortunately, I was away from the island from 25 July to 1 August and did not actually see the birds leave the gourd. Allen and Nice (op. cit.) state that "The young spend from 27 to 35 days in the nest, usually about 28." If these nestlings fledged on their 28th day, or early on their 29th day, they certainly survived. However, the *Kit Jones* left its berth at 0900 on 26 July and went into drydock at Brunswick, Georgia, 30 miles south of Sapelo, and did not return until 31 July. Unless the young fledged prior to this voyage, they possibly did not survive, since the adults did not accompany them. At any rate, the young did leave the nest either during this period or prior to it, because the gourd was empty on 1 August.

The Sapelo Island dock (Marsh Landing) is located on the Duplin River, a tidal bay which empties into Doboy Sound several hundred yards south of the dock. According to Mr. Olson, whenever the *Kit Jones* left the dock, the adult martins would follow until the vessel entered the sound, at which point

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TABLE 1

SUMMARY OF MARTIN NEST INATTENDANCE DUE TO ABSENCE OF *KIT JONES* FROM DOCK

Stage of nesting		Incubation	Nestling
Length of stage (days)		16	28
Days absent from dock		10	13
Time lost for nest attendance			
Hours lost per day:	Range	1–8	1–9
	Average	5.7	5.5
Per cent day-length lost:	Range	5–34	
(incubation stage)	Average	24	
Per cent daylight lost:	Range		10–60
(nestling stage)	Average		36
Total hours lost		57.3	72–84*
Per cent total hours**		15	17–20
Daily mean temperature	Range	60–84	75–84
(Fahrenheit)	Average	76.2	80.2

* Second value includes 12 additional hours lost during storms.
** Total hours during incubation stage = 384 hours.
Total photoperiod during nestling stage = 422 hours.

they would turn back to the dock area. Upon the return of the boat to the dock the birds would return to the gourd.

Throughout June and July the *Kit Jones* was being used several times weekly for offshore collecting or trips to the mainland, about six miles away. From the vessel's log it was possible to determine the dates, time of day, and duration of time the vessel was absent from its berth during the incubation and nestling periods. These data are summarized in Table 1, which shows the range and mean of the time lost from nest attendance by the parents. The range of daily mean temperatures and the average temperature for each period are also given. The daily photoperiod during the nestling stage was obtained from sunrise and sunset data in the U.S. Coast and Geodetic Survey 1961 Tide Tables. One hour of daylight was added to these data to allow for light prior to sunrise and after sunset.

During the estimated 15-day period of incubation (cf. Allen and Nice, op. cit.) the *Kit Jones* was away from its berth nine days out of 15 for varying periods ranging from one to eight hours duration. The maximum periods (on five different days) represent a loss of only approximately 35% of the total daylength (24 hours) available for incubation. Thus the adult, on those days, could still, theoretically, incubate the eggs for 65% of the day. Allen (Allen and Nice, op. cit.) states "The female incubates about 70% of the day. . . ." For three nests he found incubation coverage to range from 49 to

90% at temperatures of 58 F to 70 F, respectively. Kendeigh (1952) found the percentage of total incubation time during the day varied from 67.6 to 81.2% (mean 76.7%) depending upon the mean air temperatures which ranged from 57 F to 70 F. During the incubation period the daily mean temperatures on Sapelo Island ranged from 60 F to 84 F, with a mean for the period of 76 F. During those days when the *Kit Jones* was absent for periods of seven or eight hours the mean maximum temperature was 85 F. In addition, while at sea the gourd was exposed to direct sunlight and as a result the inside nest temperature was probably somewhat higher. From the foregoing one must conclude that the loss of time for incubation by the female during these days was probably of no consequence in the long run to normal development of the embryos within the eggs.

Table 1 also presents the average daily loss of feeding time of the young by the adults as a result of the *Kit Jones*' absence from the dock area. Assuming a 28-day nestling period, the young were separated from their parents on 13 days for varying periods of time ranging from one to nine hours or 10 to 60% of the available daylight hours. On five of these days the separation ranged from 52 to 60%: on two days, 40–50%; and on six days, 10–20% of the daylight hours. The longest absence of nine hours occurred on 3 July, when the young were six days old. The shortest absence, for one hour, occurred on 12 July, when the young were 15 days old, although the boat left the dock twice that day, the second trip in late afternoon being for 1.5 hours.

The greatest feeding activity of nestlings by adult birds, in general, takes place during the early hours of the morning and the hours just before dusk. All of the periods of long absence, i.e., periods over seven hours duration, occurred between the hours of 0800–1900, thus on those days the adults were able to feed their young for at least two hours prior to departure and two hours after return of the *Kit Jones*. Only once, on 4 and 5 July when the young were eight and nine days of age, did two absences of long duration occur consecutively. During the remainder of the nestling period the days with long absences were interspersed by days with absences of zero, one, or two hours duration. The percentage of daylight available to the adults for feeding the young each day during the nesting period is illustrated by the histogram in Fig. 1. A maximum of 350 hours, or 83% of a total photoperiod of 422 hours, was available for feeding the young birds during the nestling stage. Since this figure includes daylight hours during thunderstorms which occurred several times weekly in the late afternoon and lasted about an hour, probably not more than 80% of the total photoperiod was available.

A protracted period of several hours of daylight without food can be a serious hazard for nestling passerines by preventing normal rates of growth and development. It is suggested here that perhaps martins possess the ability

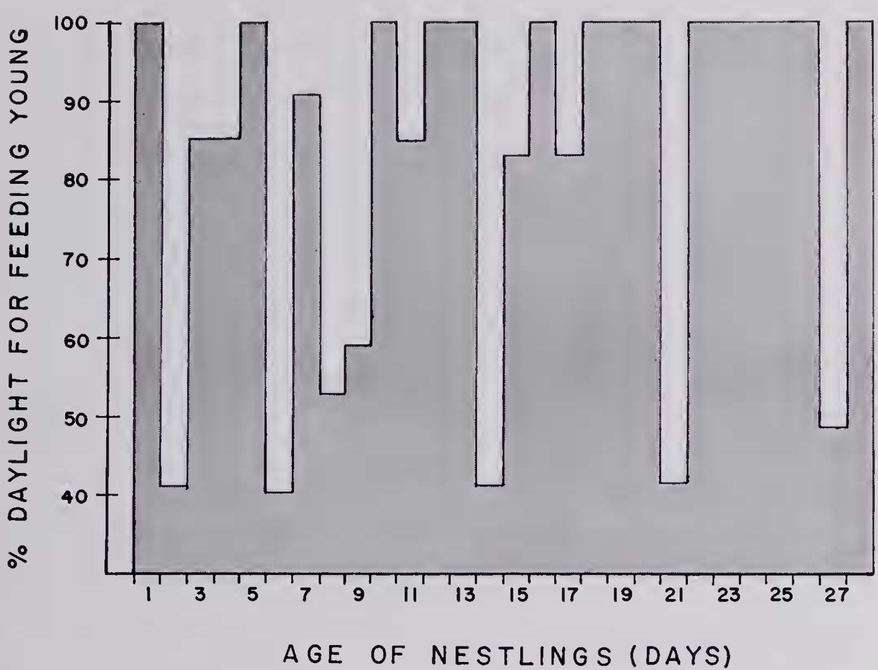

FIG. 1. Percentage of daylight available for feeding young martins during nestling stage, 28 June–25 July 1961.

to store food reserves during periods of adequate feeding which, in the present instance, enabled them to survive the prolonged absences from their parents. It is known, for example, that nestlings of swifts store food reserves during periods of good weather (Lack and Lack, 1951), an adaptation enabling them to survive rainy or cold periods. The extent of lipid reserves in nestling or adult martins has not been determined; however, Allen and Nice (op. cit.) state that "the birds gain rapidly until 12 days of age, when they weigh from 42 to 47 grams. After this they gain less rapidly until about the 20th day when they weigh between 55 and 60 grams." This is several grams above the average weight of fledged young and adult birds. Some of this excess weight, of course, is going into feather development.

The fact that the adult martins were able to raise three young that were as healthy and well developed as the young raised in gourds located on the dock, yet with 20% less feeding time during the entire nestling period, raises the question as to whether the martins are rearing the largest number of young for which they are capable of providing. Lack (1954) stated: "It is considered that the clutch-size of each species of bird has been adapted by natural selection to correspond with the largest number of young for which the parents can, on the average, provide enough food." Skutch (1949) holds that although this may be true for birds at high latitudes, it does not apply to birds of the humid tropical areas. The clutch size for martins on Sapelo Island ranges from three to five eggs, with most nests containing four eggs. Most nests with young, however, contain only three nestlings, with one egg usually being infertile or addled. Thus the average clutch size is four eggs, while average brood size is three young. Sufficient observations have not been made yet to allow me to state this unequivocally. Allen and Nice (op. cit.) report mean clutch size in Michigan to be 4.9 eggs per nest, with a range of 3–7 eggs per nest. Fifty-four per cent of the nests contained five eggs, while 25% contained four eggs. Sapelo Island is near the southern limits of the breeding range for Purple Martins, and it is well known that among passerines with wide distribution clutch size tends to become smaller in the lower latitudes of the breeding range. Although one should not make broad generalizations on the basis of one example, the present case suggests that the martins on Sapelo are not raising the largest number of young for which they can provide enough food. As Gibb (1961) points out, the proximate factors involved with the variation in clutch size of birds are largely unknown, the present observations give no indication as to what these may be.

SUMMARY

Observations of a Purple Martin (*Progne subis*) nest in a gourd located on the mast of a research vessel at Sapelo Island, Georgia, were made during June and July 1961.

Three young were successfully raised to the fledgling stage by the adult martins even though interruptions of one to nine hours duration in incubation and feeding occurred several days each week by absence of the vessel from its dock. The loss of feeding time amounted to 20% of the total photoperiod available during the nestling stage.

It is hypothesized that nestling martins are able to store food reserves during periods of adequate feeding which enable them to survive prolonged periods of no feedings.

The average clutch size and brood size of martins on Sapelo Island do not appear to correspond with the largest number of young which the parents can nourish.

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LITERATURE CITED

Allen, R. W., and M. M. Nice

1952 A study of the breeding biology of the Purple Martin (*Progne subis*). *Amer. Midl. Nat.*, 47:606–665.

Gibb, J. A.

1961 Bird populations. *In* Biology and comparative physiology of birds. Ed. A. J. Marshall. Academic Press, New York, pp. 413–446.

Kendeigh, S. C.

1952 Parental care and its evolution in birds. *Ill. Biol. Monogr.*, 22:1–358.

LACK, D.
1954 The natural regulation of animal numbers. Oxford Univ. Press, London.
LACK, D. AND E. LACK
1951 Breeding biology of the swift, *Apus apus*. *Ibis*, 93:501–546.
SKUTCH, A. F.
1949 Do tropical birds rear as many young as they can nourish? *Ibis*, 91:430–455.

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